

RECOMMENDATION FOR LIGHTING



ILLUMINATING ENGINEERING BUREAU
THE WESTINGHOUSE COMPANIES

LIGHTING RECOMMENDATIONS

FOR THE

LOWELL AIRPORT

LOWELL, MASSACHUSETTS

DATE: MAY 14, 1929

SPECIFICATION: S-1165-A



ILLUMINATING ENGINEERING BUREAU
THE WESTINGHOUSE COMPANIES



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LOWELL AIRPORT

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This report presents recommendations for the lighting of the Lowell Airport in accordance with recommendations as issued by the Department of Commerce.

To obtain a Class "A" rating and to insure the safe arrival and departure of planes at night, the lighting system of an airport should consist of the following:

1. A revolving beacon to guide pilots enroute.
2. Boundary lights to indicate the limits of the area within which safe landings may be made.
3. Approach lights to indicate the most favorable avenues of approach to the landing area under normal conditions.
4. Obstruction lights to indicate the location of buildings, trees, poles or other hazards on or near the field.
5. Floodlights to illuminate the landing area.
6. Floodlights or reflectors to illuminate the roof and sides of the hangar, enabling the pilot to judge his distance from the ground.
7. An illuminated wind cone to indicate to the pilot the direction of the wind.
8. A narrow beam projector to determine the height of the "ceiling" or overhanging clouds.

The following recommendations are made regarding the use of the above mentioned equipment.

1 - REVOLVING BEACON:

The beacon recommended is the 24-inch unit with automatic lamp changer, zenith lights, prismatic lens, and 1000-watt, 115-volt, T-20 bulb Mazda Airway Beacon lamp, as illustrated on the enclosures appended. The beacon should be mounted on a tower and supplied by a 2-wire multiple circuit controlled from the main control panel in the hangar. The beam should be elevated about 1 1/2 degrees above the horizontal.

2 - BOUNDARY MARKER LIGHTS:

The unit recommended for marker lighting is illustrated and described on an appended enclosure. The boundary and approach marker lights should be installed at the points indicated on the blueprint layout at the rear of this report and supplied by a 115/230-volt, 3-wire underground circuit consisting of a #8 B & S Gauge, 600-volt, two-conductor, rubber-insulated, lead-encased, jute-covered cable and a #10 B & S Gauge bare copper wire neutral. The circuit should be in the form of a closed ring, the supply to be controlled from the control panel and to feed into the ring at any point near the panel. Data Sheet A-61-2 shows the installation methods recommended. Each unit should be provided with a clear globe and a 25-watt, 115-volt inside frosted Mazda lamps.

3 - APPROACH MARKER LIGHTS:

These units are in all respects similar to boundary marker lights except that they should be equipped with green globes and 50-watt, 115-volt inside frosted Mazda lamps. The recommended locations of the approach lights for the Lowell Airport are indicated on the blueprint layout.

4 - OBSTRUCTION MARKER LIGHTS:

Marker light equipped with red globes and 50-watt, 115-volt inside frosted Mazda lamps should be located at the points indicated on the blueprint layout. The units on the buildings and towers should be supplied by circuits of rubber-covered wire in conduit and connected to the underground boundary marker circuit at each building or tower.

The 165-foot tower should be marked by three units at the highest point, two opposite units one-third the distance from the top, and two opposite units two-thirds the distance from the top. The tower on the property of the Consolidated Randering Company should be marked by three units at the top and two at one-half the distance to the ground. The beacon tower should be marked as shown on Data Sheet A-57.

5 - LANDING FIELD FLOODLIGHTS:

The landing area should be floodlighted by airport floodlights illustrated and described on an appended enclosure and located as shown on the layout. Each unit should be equipped with a louver assembly, prong base lamp socket, the spread lens indicated and a 3 Kw. 32-volt Mazda Airport Floodlight lamp.

Each of the groups of projectors should be placed on a separate circuit and controlled through different switches, so that any group may be turned on depending on the direction in which the plane will land.

The power supply to the projector groups should be taken from the 2300-volt supply in the hangar through fused, disconnecting cutouts to two Form AN-2 Class 2300 RCOC Oil Switches, operated by remote control from the main control panel. The circuit

from these switches to the floodlights should be through No. 8, 2500-vol 2-conductor, rubber-insulated, lead-encased, jute-covered cable laid in the same trench as the marker circuit

At each group of projectors a small shed should be constructed as shown on Data Sheet A-70-2 to house the equipment shown thereon. The transformer should be of 10 kv-a. capacity.

The installation shown on the layout makes it possible to land in any direction without landing directly toward a light source and will provide a minimum vertical normal intensity of .15 foot-candle at any point on the landing area.

6 - HANGAR LIGHTING:

The method of illuminating the hangar is shown on Data Sheet A-59. A value of H = 20 feet was assumed in calculating the number of elliptical angle fixtures required to illuminate the sides.

To facilitate ground operations incident to the arrival and departure of planes at night, two standard floodlight projectors with diffusing lenses and 500-watt, 115-volt general service Mazda lamps should be mounted on the hangar roof.

7 - WIND INDICATOR LIGHTS:

The wind indicator should be of the standard cone construction and mounted on a pipe standard as shown on Data Sheet A-60-X. Illumination should be provided by four standard Bowl Reflector-Socket fixtures equipped with 100-watt, 115-volt Mazda lamps.

8 - CEILING PROJECTOR:

A 12-inch narrow beam projector as illustrated and described on an appended enclosure should be installed on the

building at the approximate location shown on the blueprint layout. The beam should be directed upward at a convenient angle and toward the control room in the hangar. By means of an alidade graduated to read directly in feet the operator can determine the ceiling height by sighting at the light spot thrown on the clouds by the projector.

The unit should be provided with a 400-watt, 115-volt, G-30 bulb Mazda Spotlight lamp connected to the building lighting mains thru a Form NR-2000-2 RCOC Relay with 115-volt operating coil. The relay should be controlled from the main control panel in the hangar through an underground pilot circuit of #10, 600-volt, single-conductor, rubber-insulated, lead-encased, jute-covered cable, using ground return.

SUMMARY OF EQUIPMENT RECOMMENDED

- 1 - Sperry 24-inch Type DCB Rotating Beacon with automatic lamp changer, zenith lights and prismatic lens

FIELD FLOODLIGHTING

- 4 - Westinghouse Chromilite Landing Field Floodlights with louvers, prong base sockets, and 50 degree rectilinear spread lenses S#349497
- 2 - Westinghouse Chromilite Landing Field Floodlights with louvers, prong base sockets, and 100 degree rectilinear spread lenses S#349498
- 1 - Westinghouse Daylight Lampsetter for Airport Floodlights S#349533
- 2 - Westinghouse 10 kv-a. Type S Distribution Transformers, 2300/32 volts, similar to S#326424, with oil and hanger irons
- 2 - RCOC Form AN-2 Class 2300 Switches with 115-volt operating coils
- 6 - Westinghouse Type AL, 100-ampere knife switches S#554392
- 4 - Westinghouse Plug Type, Fused Cutouts S#287325

- 2600 - Feet #8, 2500-volt, 2-conductor, rubber-insulated, lead-encased, jute-covered cable.
- 280 - Feet #1, 600-volt, single-conductor, rubber-covered, double-braided stranded cable.

MARKER LIGHTING

- 17 - Westinghouse Multiple Vapor Proof Marker Lights with clear globes and locking globe protecting guards S#343863
- 6 - Westinghouse Multiple Vapor Proof Marker Lights with green globes and locking globe protecting guards S#343864
- 27 - Westinghouse Multiple Vapor Proof Marker Lights with red globes and locking globe protecting guards S#343865
- 1 - Locking wrench S#349588
- 6000 - Feet No. 8 B & S Gauge, 600-volt, two-conductor, rubber-insulated, lead-encased, jute-covered cable.
- 6000 - Feet No. 10 bare copper wire

HANGAR AND WIND CONE LIGHTING

- 34 - Westinghouse Elliptical Angle Reflector-Socket Fixtures for conduit mounting S#343561 (150-watt)
- 40 - Westinghouse RLM Standard Dome Reflector-Socket Fixtures for conduit mounting S#343703 (200-watt)
- 4 - Westinghouse Bowl Reflector-Socket Fixtures for wind cone S#343748
- 2 - Westinghouse Type CA-14 Floodlights with narrow beam reflectors and diffusing lenses S#349328

CEILING PROJECTOR

- 1 - Sperry 12-inch Ceiling Projector
- 750 - Feet #10, 600-volt, single-conductor, rubber-insulated, lead-encased, jute-covered cable (Pilot circuit)
- 1 - RCOC Form MR-2000-2 Relay

SUMMARY OF WESTINGHOUSE MAZDA LAMPS

- 2 - 1000-watt, 115-volt, T-20 bulb Airway Beacon lamps
- 1 - 400-watt, 115-volt, G-30 bulb Spotlight lamp (Ceiling Projector)
- 6 - 3000-watt, 32-volt Airport Floodlight lamps

- 17 - 25-watt, 115-volt, inside frosted lamps
- 33 - 50-watt, 115-volt, inside frosted lamps
- 4 - 100-watt, 115-volt, inside frosted lamps
- 34 - 150-watt, 115-volt, PS-25 bulb lamps
- 40 - 200-watt, 115-volt, PS-30 bulb lamps
- 2 - 500-watt, 115-volt, PS-40 bulb lamps

ILLUMINATING ENGINEERING BUREAU

THE WESTINGHOUSE COMPANIES

PRESENTED BY

Robert B. Kelly

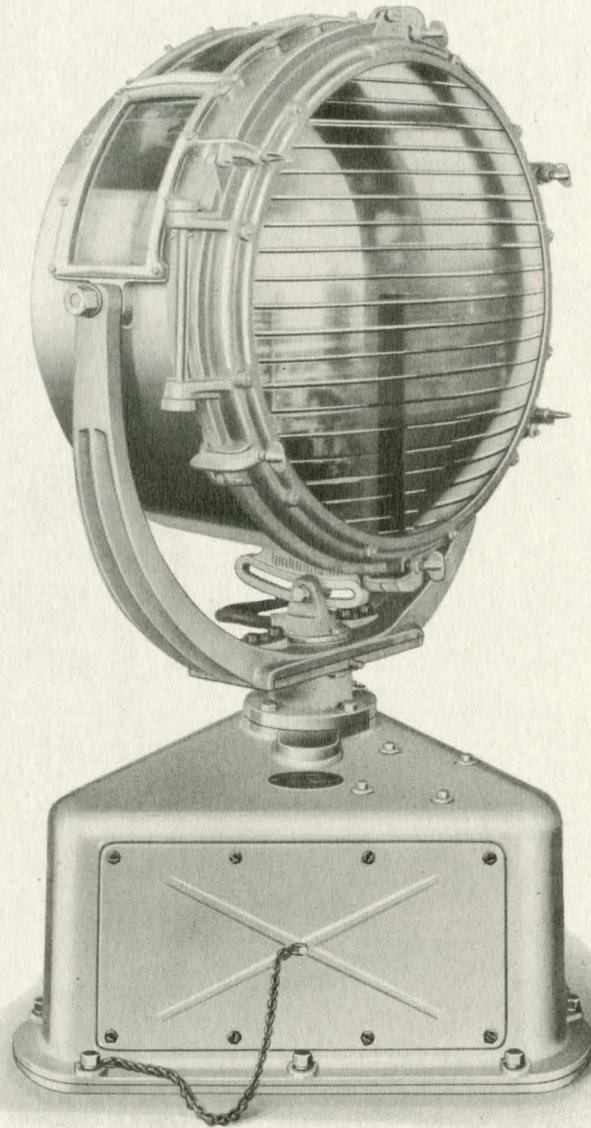
DATE: MAY 14, 1929

SPECIFICATION: S-1165-A

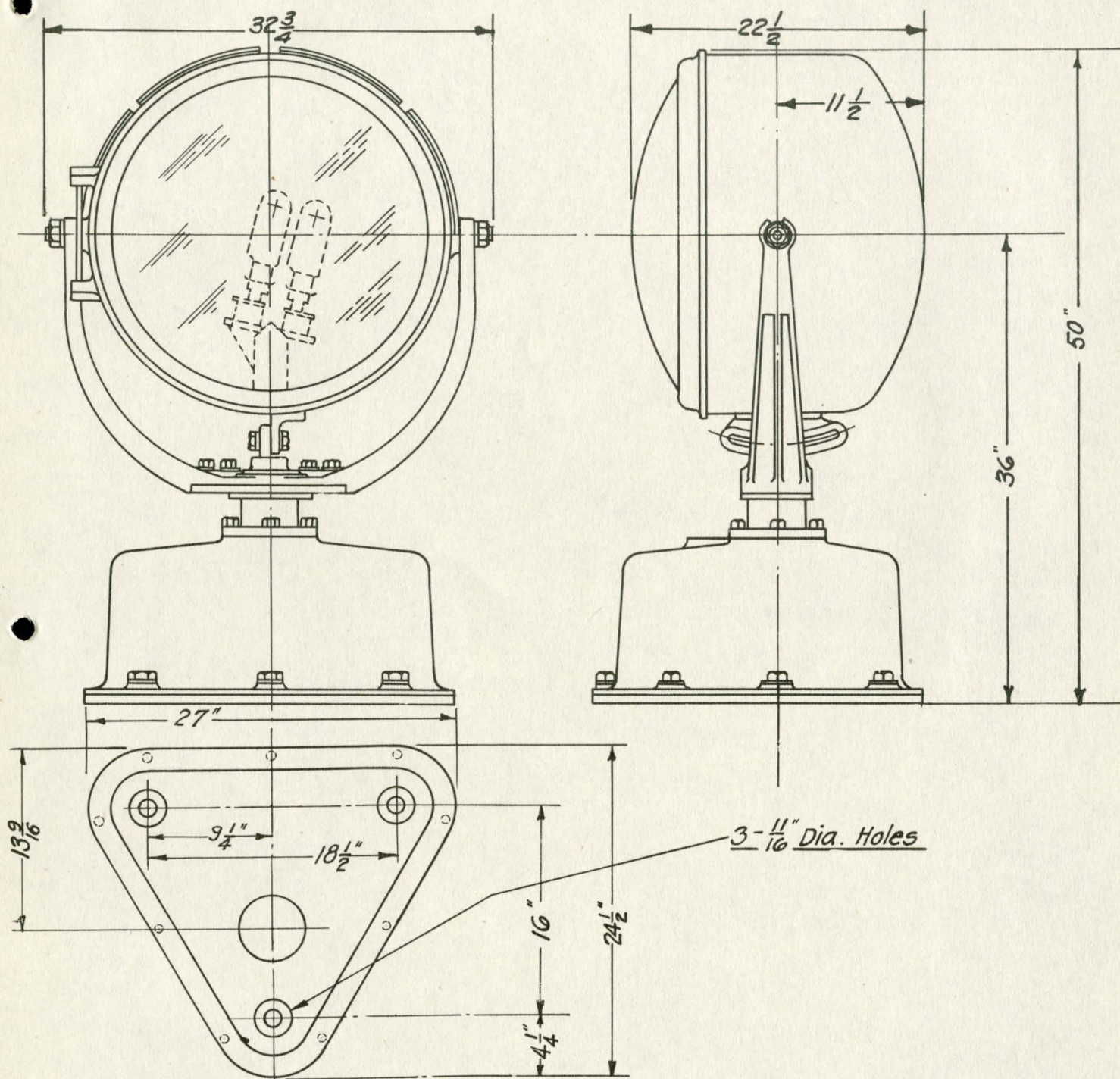
DRAWING: S-1165.Y

PREPARED BY *H. E. Lippman*

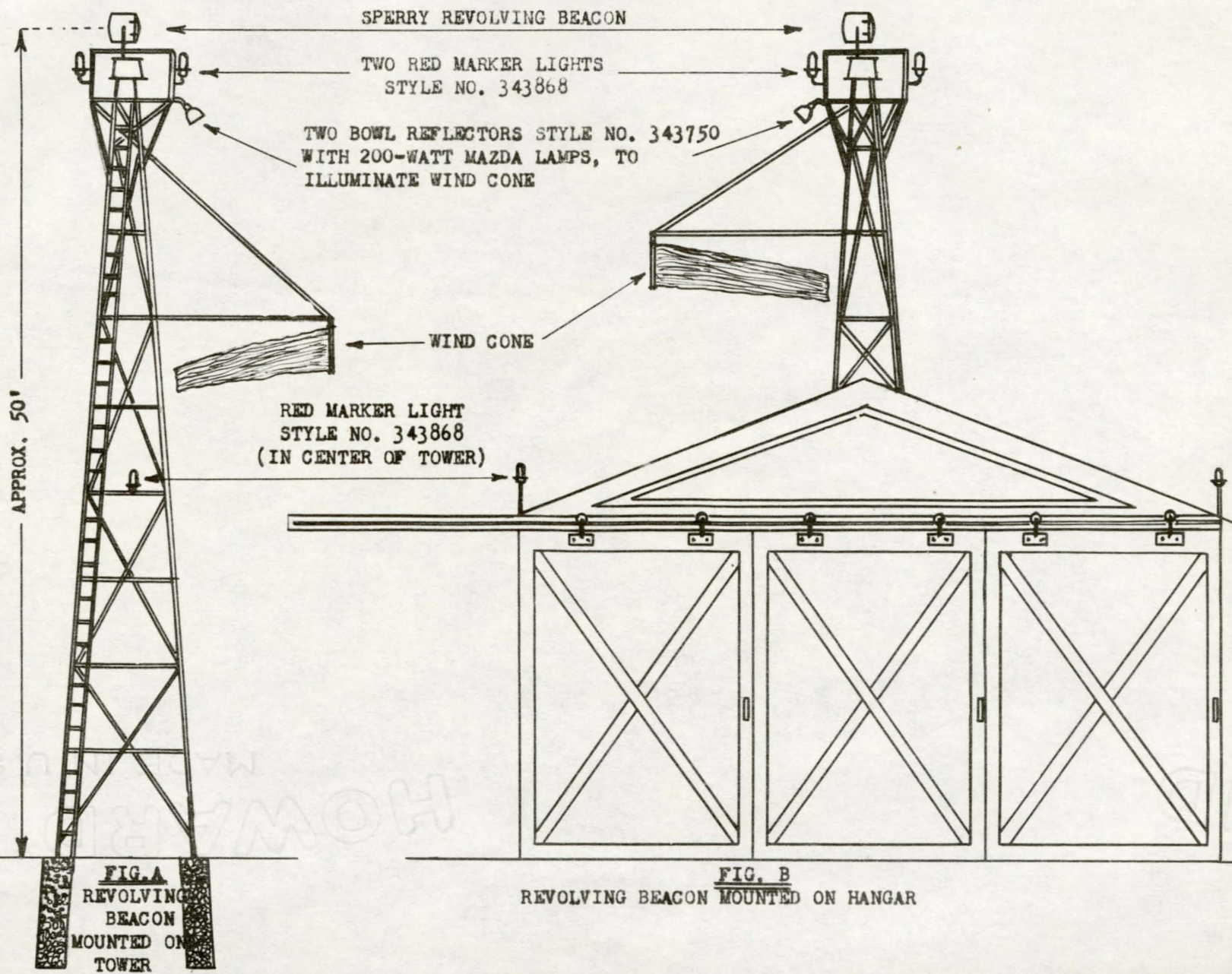
H. E. Lippman



SPERRY 24 INCH AIRWAY BEACON, DEPT. OF COMMERCE TYPE

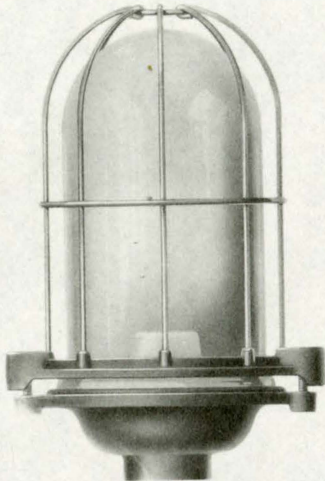


DIMENSIONAL DRAWINGS OF THE SPERRY 24 INCH AIRWAY BEACON, DEPT. OF COMMERCE TYPE.
 NET WEIGHT 325 LBS. GROSS WEIGHT 545 LBS.



ILLUMINATING ENGINEERING BUREAU	
THE WESTINGHOUSE COMPANIES	
METHODS OF MOUNTING REVOLVING BEACON AT AIRPORTS AND LOCATION OF OBSTRUCTION MARKER LIGHTS	
DESIGNED BY H.E.L.	DATE OCT. 15, 1928
SCALE	NO. A-57

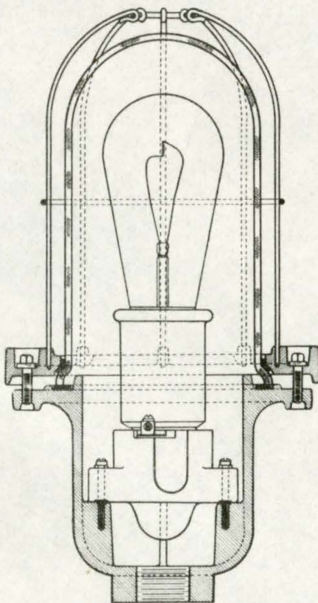
THE VAPOR PROOF MARKER LIGHT



Westinghouse Vapor Proof
Marker Light For
Multiple Lamps

The marker lighting unit for multiple lamps should consist of a cast aluminum socket housing tapped for 3/4-inch pipe, a standard porcelain medium lamp socket, a globe sufficiently large to accommodate a 150-watt lamp, a locking globe-holding ring and, in the case of units installed in locations where malicious or accidental breakage of globes is liable to occur, a bronze globe-protecting guard.

The joints between the globe-holding ring, globe, and socket housing should be provided with gaskets to exclude dust and moisture and reduce globe breakage. Accumulated moisture should be prevented from entering the pipe supporting the unit and drained from the housing through two drain holes located at the bottom of the trough formed by the wall of the housing and an annular projection surrounding the tapped hole. Both the socket housing and the globe-holding ring should be cast with two opposite projecting lugs, each drilled and tapped to accommodate a collar head screw by which the required pressure is obtained to firmly hold the globe to its seat. The screw head should be made to fit in a recess so that a special wrench is required for its removal.



Sectional View
Westinghouse Vapor Proof
Marker Light For
Series Lamps

The marker lighting unit for series lamps should be similar in construction to the multiple unit described above, except that the socket housing should be tapped for 1 1/4-inch pipe and made to accommodate a series lamp socket.

The series socket should consist of a porcelain husk having contact prongs of spring bronze to hold a film cutout. When the lamp burns out, the full open circuit voltage of the regulator or safety coil secondary is impressed across the dielectric film, causing it to puncture and reestablish the series circuit to the remainder of the lamps on the circuit or short circuit the safety coil secondary.

The socket receptacle should be of porcelain and contain a pair of spring bronze contact clips provided with binding posts. When the socket is placed in the receptacle the spring clips should be forced apart by the socket prongs, establishing the circuit through the socket. When the socket is removed, the receptacle clips should make contact with each other and maintain the circuit to the remainder of the units of the line.

MULTIPLE VAPOR PROOF MARKER LIGHT
WITH CLEAR GLOBE AND GUARD S#343863
WITH GREEN GLOBE AND GUARD S#343864
WITH RED GLOBE AND GUARD S#343865

APPLETON TYPE "YC" UNILET
CAT. #23143, OR EQUAL

BRYANT CUTOUT BLOCK 1917
WITH CARTRIDGE FUSE AND
LUG ON GROUND SIDE

APPLETON TYPE "C"
UNILET CAT. #9082,
COVER CAT. #6130-F
OR EQUAL

$\frac{3}{4}$ " GALVANIZED CONDUIT

$1\frac{1}{2}$ " x $\frac{3}{4}$ " BUSHING

CONNECT LEADS OF SAME COLOR
TOGETHER

$1\frac{1}{2}$ " GALVANIZED CONDUIT

WHITWASHED STONES

GROUND LEVEL

$1\frac{1}{2}$ " RAD.

$1\frac{1}{2}$ " GALVANIZED CONDUIT Y

#10 BARE COPPER WIRE

BOTTOM OF TRENCH

600-VOLT, TWO CONDUCTOR, LEAD
ENCASED, RUBBER INSULATED, JUTE
COVERED CABLE - SIZE DEPENDS ON
NUMBER OF UNITS ON CIRCUIT

3' OR HIGHER, DEPEND-
ING ON HEIGHT OF
SURROUNDING OB-
STRUCTIONS

1'

1'

FIG. A

FUSED INSTALLATION

FIG. B

UNFUSED INSTALLATION

ILLUMINATING ENGINEERING BUREAU

THE WESTINGHOUSE COMPANIES

FUSED AND UNFUSED THREE-WIRE
MULTIPLE INSTALLATION OF MARKER
LIGHTS FOR AIRPORTS

DESIGNED BY H.E.L.

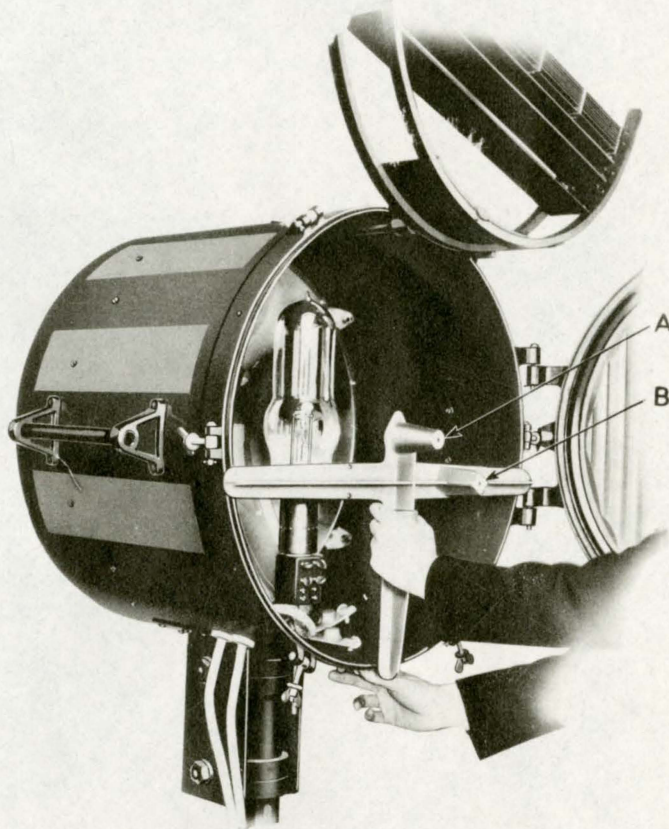
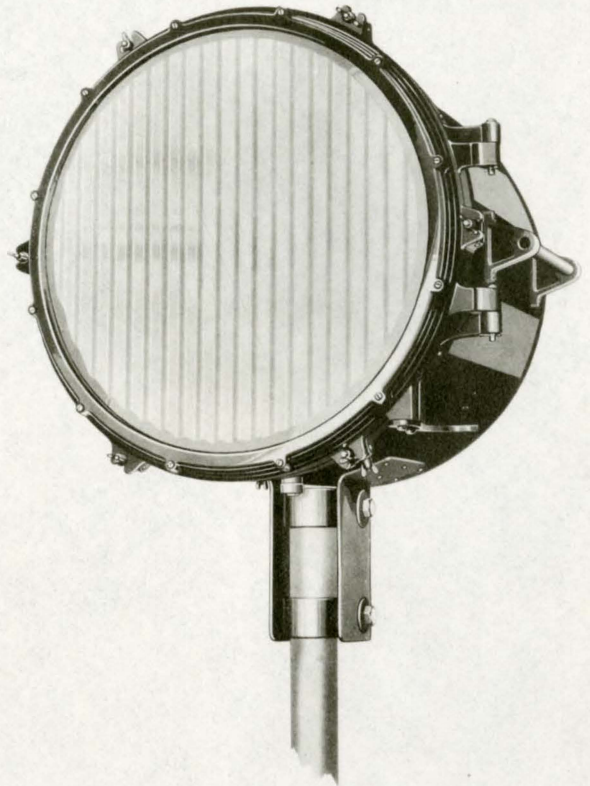
DATE OCT. 15, 1928

SCALE

NO. A-61-2

THE WESTINGHOUSE CHROMILITE LANDING FIELD FLOODLIGHT

FRONT VIEW WITH DOOR CLOSED



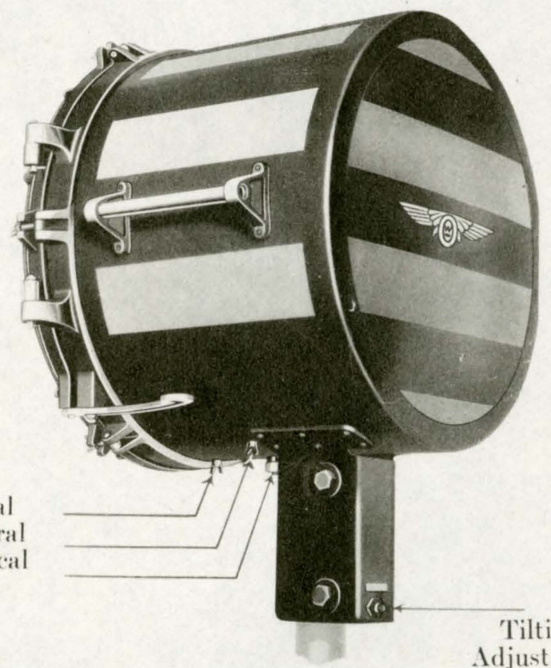
REAR VIEW WITH DOOR CLOSED

FRONT VIEW WITH DOOR OPEN, LOUVER ASSEMBLY WITHDRAWN, AND THE DAYLIGHT LAMPSETTER IN POSITION FOR FOCUSING THE LAMP

- A—Sight for vertical and lateral adjustment.
- B—Sight for axial adjustment.

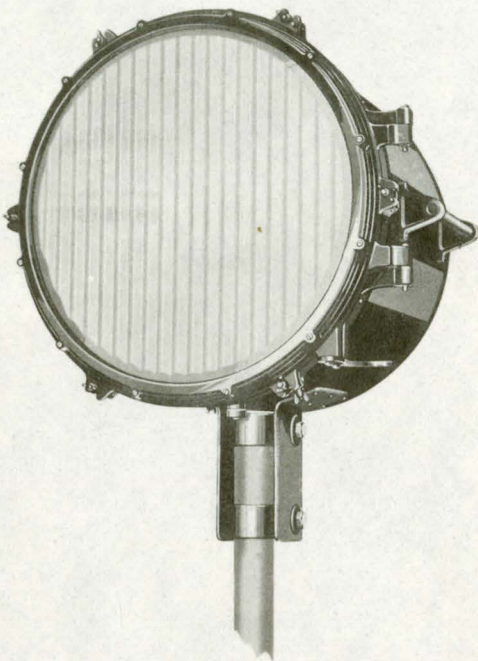
Micrometer
Lamp Focusing
Adjustments

Axial
Lateral
Vertical

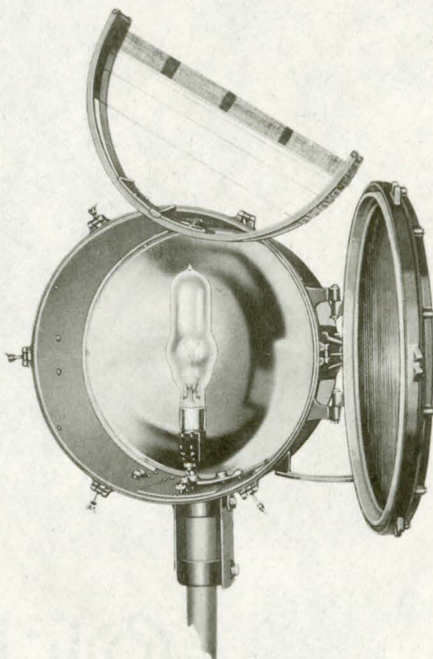


Tilting
Adjustment

THE AIRPORT FLOODLIGHT



Westinghouse Airport
Floodlight with Spread
Lens - Front View



Interior View with
Louver Assembly withdrawn

The primary requisites for airplane landing field illumination are a reasonably high intensity on the landing area, absence of glare, fairly uniform distribution of light, and absence of shadows. The equipment which fulfills these requirements should be reliable, durable in construction, and low in first cost, operation, and maintenance. It should be possible to operate the light source from either an alternating or direct current supply without auxiliary converting equipment or the services of a skilled operator.

The floodlight should consist essentially of a housing, reflector, adjustable lamp socket, door and louver assembly.

The housing should be made of heavy gauge, copper-bearing, sheet steel with all seams electrically welded and smoothly finished.

The reflector should be of metal plated with chromium to prevent rapid deterioration or scratching of the surface.

The lamp focusing mechanism should consist essentially of three externally operated thumb screws, one for each of the directions necessary for the correct focusing of the lamp. It should also be possible to rotate the lamp socket in order to properly position the lamp.

The door frame should be of cast aluminum alloy, hinged to the projector housing at the side and provided with a device to automatically hold it in its open position while an attendant is cleaning or relamping the floodlight. The joint between the door and the housing should be provided with a gasket to exclude dust and moisture, the required pressure to be obtained by not less than six T-bolts and wing nuts hinged to the projector housing at equal intervals. The door frame should be provided with one of three types of rectilinear spread lenses, depending on the application, giving beams of 20, ~~45~~⁴⁵, or ~~60~~⁶⁰ degrees horizontal and about 4 degrees vertical divergence. To reduce breakage in shipping and installing, the lens should be semi-permanently sealed in the door frame between two cast-aluminum retaining rings with gaskets, forming a single unit.

To prevent upward glare an assembly of louvers should be provided to intercept the direct light of the lamp above the horizontal without appreciably affecting the beam characteristics.

CHROMILITE LANDING
FIELD FLOODLIGHTS } MOUNT 7' TO LIGHT CENTER, OR HIGHER
IF LANDING SURFACE IS UNEVEN OR
ROLLING

PLUG TYPE FUSED CUTOUT S#287325

CONDUIT OUTLET FITTING

#8, 2500-VOLT, R.C.D.B. WIRE

FRANKEL #2560
SOLDERLESS
CONNECTORS

2 1/2" GALVANIZED
PIPE STANDARD

1 1/2" GALVANIZED
CONDUIT

FRANKEL #2568 LUG

1/8" FLAT BUS BAR

2 1/2" ANGLE IRON SUPPORT
BUS BAR BRACKET S#240190
BUS BAR SUPPORT S#238470

TYPE A, 100 AMPERE
KNIFE SWITCH WITH
CARTRIDGE FUSES AND
QUICK-BREAK ATTACH-
MENTS S#227983

#1, 600-VOLT, R.C.D.B.
STRANDED CABLE

1 1/2" FIBER CONDUIT

1 1/2" GALVANIZED CONDUIT

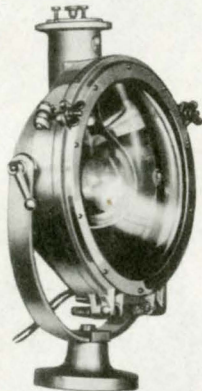
TYPE S TRANSFORMER
2300-VOLT PRIMARY
32/64 VOLT SEC-
ONDARY

BUS BAR WIDTHS	
FLOODLIGHTS IN GROUPS	WIDTH INCHES
2	1
3	1 1/2
4	2
5	2 1/2
6	3
7	3 1/2
8	4
9	4 1/2
10	5

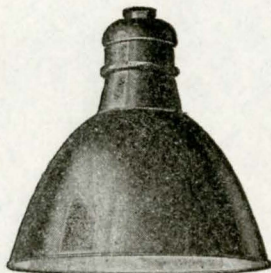
#8, 2500-VOLT, TWO-CON-
DUCTOR, RUBBER INSULAT-
ED, LEAD ENCASED, JUTE
COVERED CABLE, TO
POWER SUPPLY

ILLUMINATING ENGINEERING BUREAU
THE WESTINGHOUSE COMPANIES
INSTALLATION OF GROUP OF CHROMILITE
AIRPORT FLOODLIGHTS SUPPLIED
DIRECTLY BY 2300/32 VOLT TRANSFORMER
DESIGNED BY H.E.L.
DATE OCT. 15, 1928
SCALE
NO. A-70-2

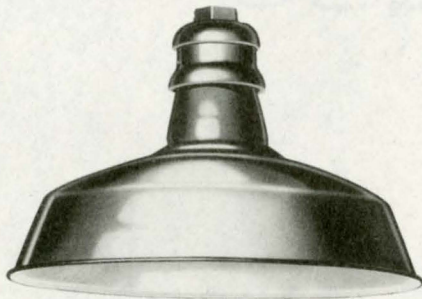
WESTINGHOUSE LIGHTING EQUIPMENT FOR MISCELLANEOUS APPLICATIONS ON AIRPORTS



STANDARD CAST ALUMINUM
FLOODLIGHTING PROJECTOR
For illuminating hangar exterior and ground
adjacent to hangar entrance.



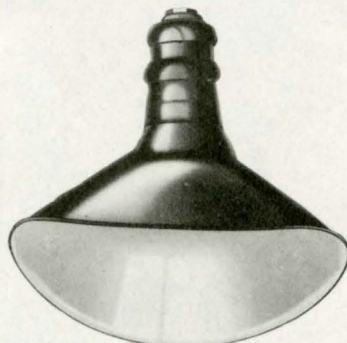
STANDARD BOWL REFLECTOR WITH
CONDUIT MOUNTING REFLECTOR-SOCKET
For illuminating wind cone.



RLM STANDARD DOME REFLECTOR WITH
CONDUIT MOUNTING REFLECTOR-SOCKET
For illuminating roof and interior of hangar
and hangar entrance.



Side View



Front View

ELLIPTICAL ANGLE REFLECTOR WITH
CONDUIT MOUNTING REFLECTOR-SOCKET
For illuminating walls of hangar.

OBSTRUCTION MARKER LIGHT
STYLE NO. 343865

DUPLICATE THIS
EQUIPMENT ON THE
OTHER TWO OUTLETS
OF THE 4-WAY
CONDULET BODY

$\frac{3}{4}$ " x $\frac{1}{2}$ " REDUCER
AND $\frac{3}{4}$ " CLOSE NIPPLE

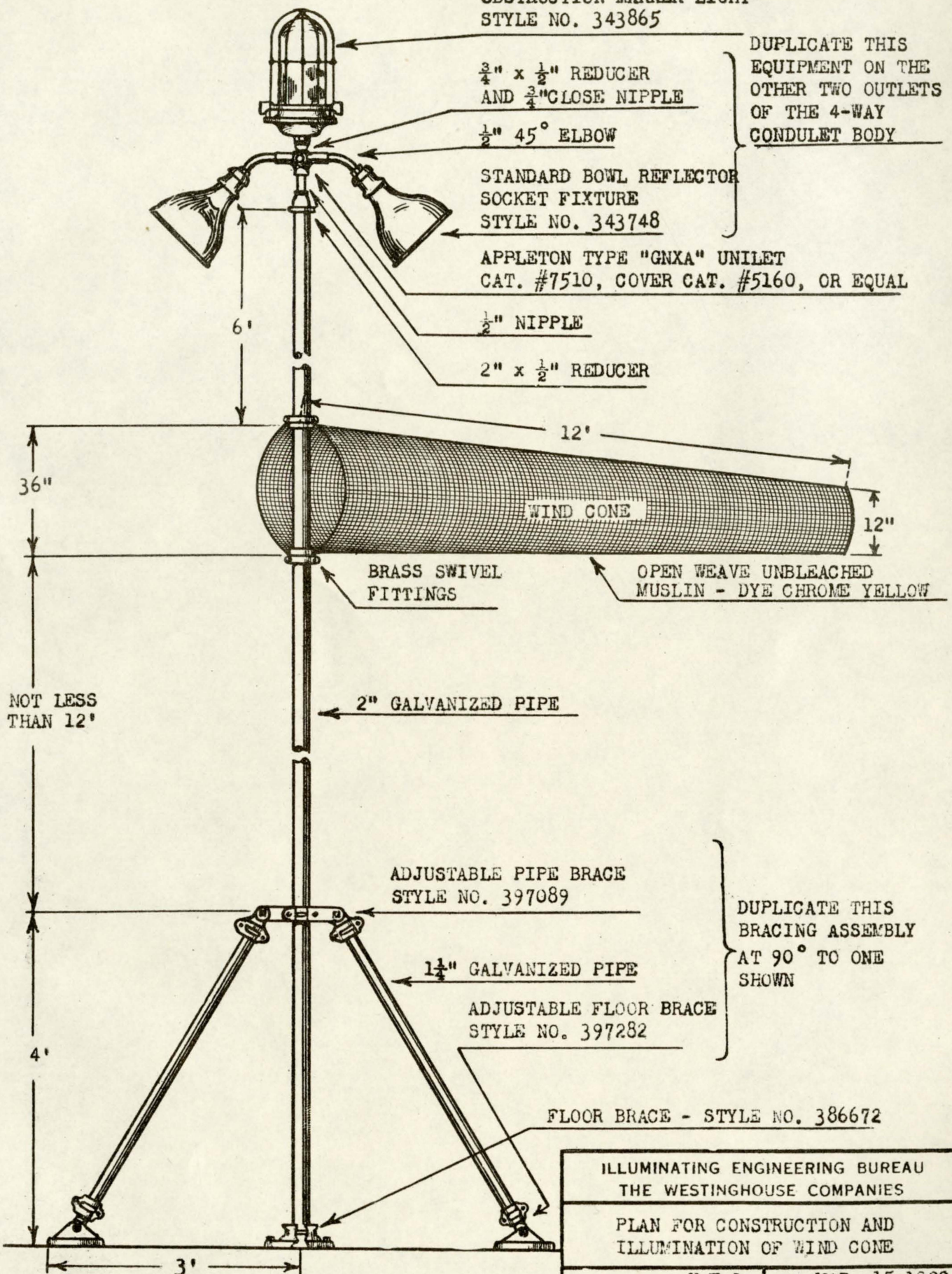
$\frac{1}{2}$ " 45° ELBOW

STANDARD BOWL REFLECTOR
SOCKET FIXTURE
STYLE NO. 343748

APPLETON TYPE "GNXA" UNILET
CAT. #7510, COVER CAT. #5160, OR EQUAL

$\frac{1}{2}$ " NIPPLE

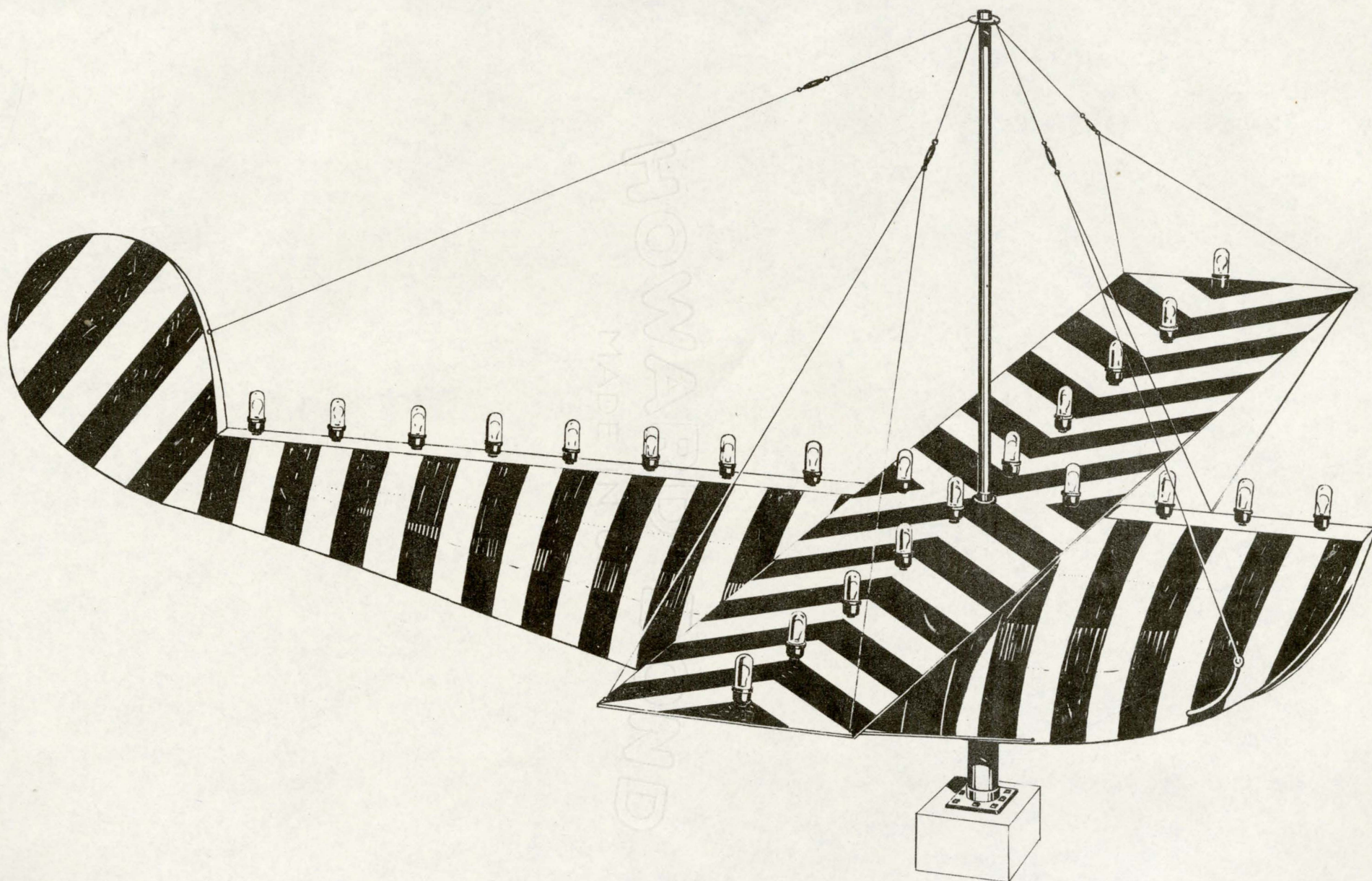
2" x $\frac{1}{2}$ " REDUCER



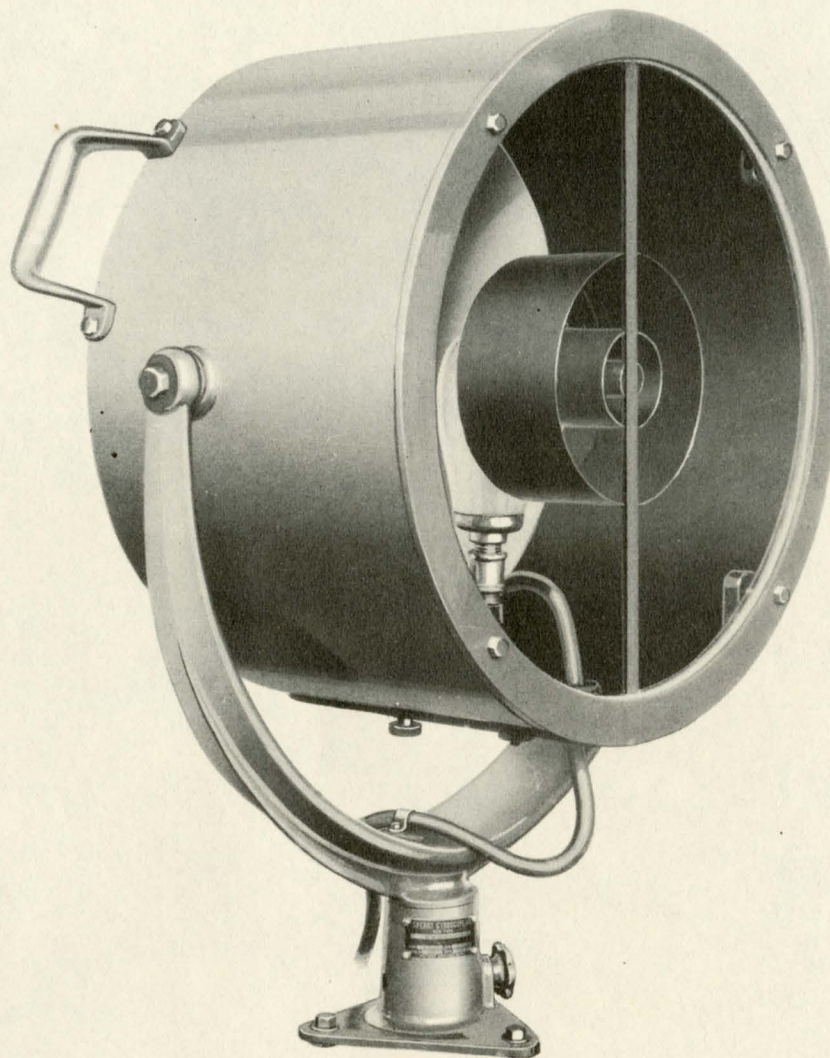
ILLUMINATING ENGINEERING BUREAU
THE WESTINGHOUSE COMPANIES

PLAN FOR CONSTRUCTION AND
ILLUMINATION OF WIND CONE

DESIGNED BY H.E.L.	DATE MAR. 15, 1929
SCALE	NO A-60-X



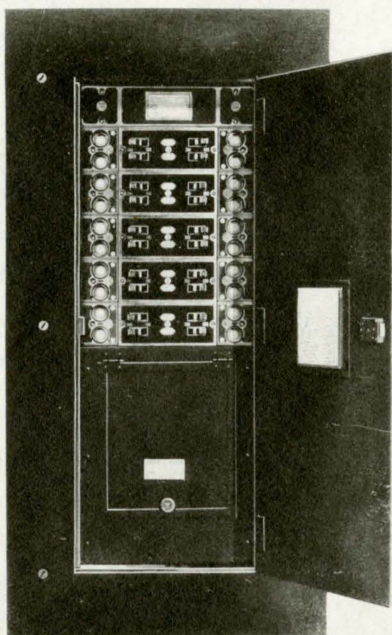
WESTINGHOUSE-QUALLS ILLUMINATED WIND DIRECTION INDICATOR



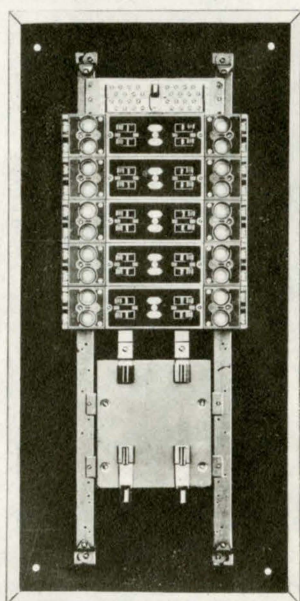
SPERRY
INCANDESCENT CEILING PROJECTOR

If it is desired to have a separate ceiling projector to be mounted on the hanger in a fixed position, either the 12-inch or 18-inch spot mounting incandescent search-light will be satisfactory, as they are specially adapted for use on night landing fields to determine the height of the clouds, or ceiling, above the field. The projector may be permanently fixed at an angle of 45 degrees and the height of the clouds, or ceiling, may be obtained in the same manner as previously mentioned. Five hundred-watt and 1000-watt, 110-volt lamps are used with the 12-inch and 18-inch projectors, respectively, and will operate on either A.C. or D.C. current.

PANELBOARDS



Westinghouse Type NST Panelboard Complete with Trim, Door Open



Westinghouse Type NST Panelboard with Front Removed, Showing Mains and Neutral

The panelboards which control the lighting circuits of airports should be safe, reliable, of durable construction, and easy to operate, maintain and inspect.

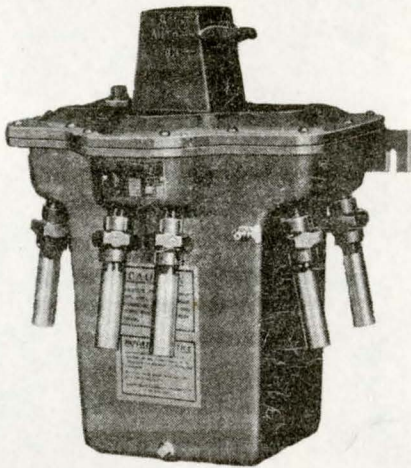
The panelboard should consist essentially of a box, a panel and a front.

The box should be made of one piece code gauge steel welded at the corners. A $\frac{3}{4}$ -inch flange should be turned in all around the outside edge for fastening the trim and making the box more rigid. The box should also be equipped with adjustable corner irons to facilitate installation and allow the panel to be set plumb and true in the box, even if the box is set below the level of the wall.

The panel should be made up of unit sections of cold molded, fire and moisture proof asbestos. Each section should be equipped with four 30-ampere, single-pole, 250-volt tumbler switches and four fuses, mounted on a common base. The switches should be removable from the front of the panelboard without disturbing the trim.

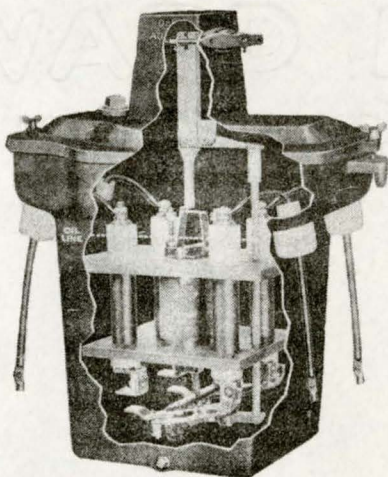
The front should be made of a single piece of code gauge steel with the door cut out, leaving a trim all around the door. The door should close against a $\frac{3}{4}$ -inch rabbet welded along the inner edge of the trim, and should be fitted to the trim with flush type hinges. Either single or double door may be used. The front should also be equipped with indicating trim clamps, which facilitate proper adjustment of the trim on the box under adverse conditions.

THE REMOTE CONTROL OIL SWITCH



**R-C-O-C FORM AN CLASS 7500
SUBWAY TYPE SWITCH**

RATED VOLTAGE - 7500
RATED CURRENT PER SWITCH
100 amp. at 220 volts
60 amp. at 2300 volts
25 amp. at 4600 volts
15 amp. at 6600 volts
10 amp. at 7500 volts



**R-C-O-C FORM AN CLASS 2300
POLE TYPE SWITCH**

RATED VOLTAGE - 2300
RATED CURRENT PER SWITCH
75 amp. at 220 volts
at 2300 volts

The constant current regulating transformer, distribution transformer, or other lighting load should be controlled by an oil insulated, remote controlled, circuit closing (normally open) type switch, consisting essentially of a circuit-closing mechanism mounting in a transformer type, oil filled, cast-iron case provided with the required number of leads in moisture-proof bushings.

The mechanism should be designed to operate by the solenoid principle, requiring the operating coils to be energized to close and hold the switch contacts. When energized continuously the operating coils should not consume more than 30-watts, nor should they require more than four times this value at the instant of actual closing of switch contacts. Coils should be available for use on D.C. or on A.C. of any specified frequency. When designed for multiple circuits, positive operation should be obtained on voltages twenty percent below rated coil voltage, and the switch should not open unless the coil voltage falls to twenty percent of rated voltage, or less. To insure long life, contacts should be constructed of hard rolled copper, and with ample breaking distance between open contacts to prevent arc-over. All high voltage parts should be spaced and insulated to withstand a voltage of not less than four times the switch rating.

The switch should be available in the single, two and three pole types for 7500-volt service and in the two pole type for 2300-volt service, and for either pole or subway mounting. The case covers should be equipped with a hand lever for operating the switch in event of accident to the control circuit, or for testing. Switches should be furnished complete with the required amount of special oil having a high dielectric strength and low cold test.



CABLE

The underground circuits for this installation should be lead-encased, jute-covered cable of the following specifications:

CONDUCTOR. The conductor should be tinned, soft-drawn copper of 100 percent conductivity as compared with Mathiessen's standard.

INSULATION. The insulation should comply with the requirements of the National Board of Fire Underwriters and should be compounded with not less than 20 percent of pure rubber. Where the working pressure is to be 5000 volts or more, 30 percent Para insulation should be furnished.

After the conductor has been rubber-covered and vulcanized, it should be immersed in water and given a high potential test of two and one-half times its rated working pressure applied for five minutes. The dielectric resistance should then be measured.

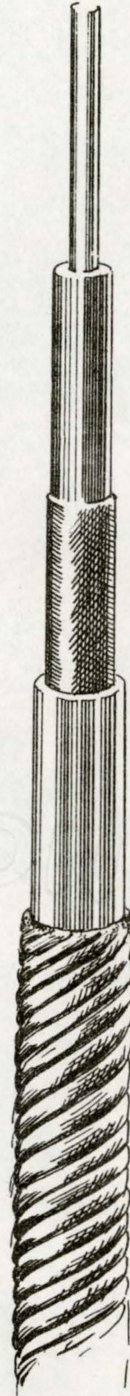
PROTECTION. A cloth tape coated with insulating compound should be wound over the rubber covering. A sheath of pure lead should be applied over the tape. For single jute-covered cable the following should be applied over the lead:

- (1) Hot asphaltum compound
- (2) A single layer of jute yarn wound with a short, close lay, saturated and coated with hot asphaltum compound. The thickness of the jute covering should not be less than $1/16$ ", measured on the finished cable.
- (3) Chalk or soapstone to prevent sticking.

For double jute-covered cable the following should be applied over the lead:

- (1) Hot asphaltum compound
- (2) Two layers of jute yarn wound in opposite directions with a short, close lay, saturated and coated with hot asphaltum compound. The combined thickness of the two layers of jute should not be less than $7/64$ ", measured on the finished cable
- (3) Chalk or soapstone to prevent sticking

After the cable has been completed, it should be given a final voltage test of two and one-half times the rated working pressure. All test sheets should be available so that the results on any particular cable may be ascertained.



Westinghouse-Hazard
Single Conductor
Rubber Insulated
Lead Encased
Jute Covered Cable

